Express Mail Label No. EL 977712086 US

[0001] CODE DETECTION

[0002] This application is a continuation of U.S. Patent Application No. 09/840,769, filed April 24, 2001, now U.S. Patent No. 6,633,600, which is a continuation of U.S. Patent Application No. 09/444,079, filed November 22, 1999, now U.S. Patent No. 6,229,843, which is a continuation of U.S. Patent Application No. 09/024,473, filed February 17, 1998, now U.S. Patent No. 5,991,332, which is a divisional of U.S. Patent Application No. 08/669,769, filed June 27, 1996, now U.S. Patent No. 5,796,776, which claims priority from U.S. Provisional Application Number 60/000,775 filed June 30, 1995.

[0003] BACKGROUND

[0004] Providing quality telecommunication services to user groups which are classified as remote, such as rural telephone systems and telephone systems in underdeveloped countries, has proved to be a challenge over recent years. The past needs created by these services have been partially satisfied by wireless radio services, such as fixed or mobile frequency division multiplex (FDM), frequency division multiple access (FDMA), time division multiplex (TDM), time division multiple access (TDMA) systems, combination frequency and time division systems (FD/TDMA), and other land mobile radio systems. Often, these remote services are faced with more potential users than can be supported simultaneously by their frequency or spectral bandwidth capacity.

[0005] Recognizing these limitations, recent advances in wireless communications have used spread spectrum modulation techniques to provide simultaneous communication by multiple users. Spread spectrum modulation refers to modulating a information signal with a spreading code signal; the spreading code signal being generated by a code generator where the period Tc of the spreading code is substantially less than the period of the information data bit or symbol signal. The code may modulate the carrier frequency upon which the information has been sent, [00171] The Adaptive Matched Filter (AMF) 1710 resolves multipath interference introduced by the air channel. The exemplary AMF ~~1717~~ 1710 uses an stage complex FIR filter as shown in FIG. 16. The received I and Q digital message signals are received at the register 1820 from the A/D converter 1730 of FIG. 15 and are multiplied in multipliers 1801, 1802, 1803, 1810, 1811 by I and Q channel weights W1 to W11 received from AMF weight generator 1722 of FIG. 15. In the exemplary embodiment, the A/D converter 1730 provides the I and Q digital receive message signal data as 2's complement 6 bits I and 6 bits Q which are clocked through an 11 stage shift register 1820 responsive to the receive spreading-code clock signal RXPNCLK. The signal RXPNCLK is generated by the timing section 1401 of code generation logic 1304. Each stage of the shift register is tapped and complex multiplied in the multipliers 1801, 1802, 1803, 1810, 1811 by individual (6-bit I and 6-bit Q) weights to provide 11 tap-weighted products which are added in adder 1830, and limited to 7-bit I and 7-bit Q values.

[00172] The CDMA modem receive section 1302 (shown in FIG. 11) provides independent channel despreaders 1703, 1704, 1705, 1706, 1707, 1708, 1709 (shown in FIG. 15) for despreading the message channels. The described embodiment despreads 7 message channels, each despreader accepting a 1-bit I b 1-bit Q spreading-code signal to perform a complex correlation of this code against a 8-bit I by 8-bit Q data input. The 7 despreaders correspond to the 7 channels; Traffic Channel 0 (TR0'), TR1', TR2', TR3', AUX (a spare channel), Automatic Power Control (APC) and pilot (PLT).

[00173] The Pilot AVC 1711 shown in FIG. 17 receives the I and Q Pilot Spreading-code sequence values PCI and PCQ into shift register 1920 responsive to the timing signal RXPNCLK, and includes 11 individual despreaders 1901 through 1911 each correlating the I and Q digital receive message signal data with a one chip delayed versions of the same pilot code sequence. Signals OE1, OE2, . . . OE11 are used by the modem control 1303 to enable the despreading operation. The output signals of the despreaders are combined in combiner 1920 forming correlation signal DSPRDAT of the Pilot AVC 1711, which is received by the ACQ & Track logic 1701 (shown in FIG.